SUBST

allowing the heat to transfer from the one or more heaters to a part of the formation;

controlling the heat such that an average heating rate of the part is less than about 1 °C per day in a pyrolysis temperature range of about 270 °C to about 400 °C;

wherein the part is heated in a reducing environment during at least a portion of the time that the part is being heated; and

producing a mixture from the formation.

2118. (amended) The method of claim 2117, wherein the one or more heaters comprise at least two heaters, and wherein controlled superposition of heat from at least the two heaters pyrolyzes at least some hydrocarbons within the part of the formation.

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2119. (amended) The method of claim 2117, further comprising maintaining a temperature within the part within the pyrolysis temperature range.

2120. (amended) The method of claim 2117, wherein at least one of the one or more heaters comprises an electrical heater.

2121. (amended) The method of claim 2117, wherein at least one of the one or more heaters comprises a surface burner.

2122. (amended) The method of claim 2117, wherein at least one of the one or more heaters comprises a flameless distributed combustor.

2123. (amended) The method of claim 2117, wherein at least one of the one or more heaters comprises a natural distributed combustor.

2124. (amended) The method of claim 2117, further comprising controlling a pressure and a temperature within at least a majority of the part of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

9 2126. (amended) The method of claim 2117, wherein providing heat from the one or more heaters to at least the portion of the formation comprises:

heating a selected volume (V) of the hydrocarbon containing formation from the one or more heaters, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

C4 wherein heating energy/day *(Pwr)* provided to the selected volume is equal to or less than $h*V*C_v*\rho_B$, wherein ρ_B is formation bulk density, and wherein an average heating rate *(h)* of the selected volume is about 10 °C/day.

11 2128. (amended) The method of claim 2117, wherein providing heat from one or more of the

C5 heaters increases a thermal conductivity of at least a portion of the part to greater than about 0.5 W/(m °C).

29 2140. (amended) The method of claim 2117, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises molecular

C6 hydrogen, wherein the molecular hydrogen is greater than about 10 % by volume of the non-condensable component at 25 °C and one atmosphere absolute pressure, and wherein the molecular hydrogen is less than about 80 % by volume of the non-condensable component at 25 °C and one atmosphere absolute pressure.

26 2143. (amended) The method of claim 2117, further comprising controlling a pressure within at

C7 least a majority of the part of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

30 2147. (amended) The method of claim 2117, further comprising controlling formation conditions by recirculating a portion of hydrogen (H_2) from the mixture into the formation.

C8 31 2148. (amended) The method of claim 2117, further comprising:

providing hydrogen (H_2) to the heated part to hydrogenate hydrocarbons within the part; and

heating a portion of the part with heat from hydrogenation.

2149. (amended) The method of claim 2117, further comprising:

producing hydrogen (H_2) and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2150. (amended) The method of claim 2117, wherein allowing the heat to transfer increases a permeability of a majority of the part to greater than about 100 millidarcy.

2151. (amended) The method of claim 2117, wherein allowing the heat to transfer increases a permeability of a majority of the part such that the permeability of the majority of the part of the formation is substantially uniform.

2153. (amended) The method of claim 2117, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heaters are disposed in the formation for each production well.

2154. (amended) The method of claim 2117, further comprising providing heat from three or more heaters to at least a portion of the formation, wherein three or more of the heaters are located in the formation in a unit of heaters, and wherein the unit of heaters comprises a triangular pattern.

2155. (amended) The method of claim 2117, further comprising providing heat from three or more heaters to at least a portion of the formation, wherein three or more of the heaters are located in the formation in a unit of heaters, wherein the unit of heaters comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2156. (amended) A method of treating a hydrocarbon containing formation in situ, comprising:

heating a ~~first section of the formation~~ to produce a mixture from the formation;

heating a second section of the formation;

controlling the heat such that an average heating rate of the first or the second section is less than about 1 °C per day in a pyrolysis temperature range of about 270 °C to about 400 °C; and

recirculating a portion of the produced mixture from the first section into the second section of the formation to provide a reducing environment within the second section of the ~~formation.~~

2157. (amended) The method of claim 2156, further comprising maintaining a temperature within the first section or the second section within the pyrolysis temperature range.

2158. (amended) The method of claim 2156, wherein heating the first or the second section comprises heating with at least one electrical heater.

2159. (amended) The method of claim 2156, wherein heating the first or the second section comprises heating with at least one surface burner.

2160. (amended) The method of claim 2156, wherein heating the first or the second section comprises heating with at least one flameless distributed combustor.

2161. (amended) The method of claim 2156, wherein heating the first or the second section comprises heating with at least one natural distributed combustor.

2164. (amended) The method of claim 2156, wherein heating the first or the second section comprises:

heating a selected volume (V) of the hydrocarbon containing formation from one or more heaters, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

~~wherein heating energy/day *(Pwr)* provided~~ to the selected volume is equal to or less than $h*V*C_v*\rho_B$, wherein ρ_B is formation bulk density, and wherein an average heating rate *(h)* of the selected volume is about 10 °C/day.

2185. (amended) The method of claim 2156, wherein heating the first or the second section comprises transferring heat substantially by conduction.

2186. (amended) The method of claim 2156, wherein heating the first or the second section increases a thermal conductivity of at least a portion of the first or the second section to greater than about 0.5 W/(m °C).

~~2186. (amended)~~ The method of claim 2156, further comprising:

producing hydrogen (H_2) and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2187. (amended) The method of claim 2156, wherein heating the first or the second section increases a permeability of a majority of the first or the second section to greater than about 100 millidarcy.

2188. (amended) The method of claim 2156, wherein heating the first or the second section increases a permeability of a majority of the first or the second section such that the permeability of the majority of the first or the second section is substantially uniform.

2190. (amended) The method of claim 2156, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heaters are disposed in the formation for each production well.

2191. (amended) The method of claim 2156, further comprising providing heat from three or more heaters to at least a portion of the formation, wherein three or more of the heaters are

located in the formation in a unit of heaters, and wherein the unit of heaters comprises a triangular pattern.

2192. (amended) The method of claim 2150, further comprising providing heat from three or more heaters to at least a portion of the formation, wherein three or more of the heaters are located in the formation in a unit of heaters, wherein the unit of heaters comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

5396. (amended) The method of claim 2153, wherein at least about 20 heaters are disposed in the formation for each production well.

5397. (amended) The method of claim 2190, wherein at least about 20 heaters are disposed in the formation for each production well.

5398. (new) A method of treating a hydrocarbon containing formation in situ, comprising:

heating a first section of the formation to produce a mixture from the formation;

heating a second section of the formation;

controlling a pressure and a temperature within at least a majority of the first or second section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure; and

introducing a portion of the produced mixture from the first section into the second section of the formation to provide a reducing environment within the second section of the formation.

5399. (new) The method of claim 5398, further comprising controlling the heat such that an average heating rate of the first section or the second section is less than about 1 °C per day in a pyrolysis temperature range of about 270 °C to about 400 °C.

5400. (new) The method of claim 5398, wherein the portion of the produced mixture introduced to the second section comprises molecular hydrogen.

5401. (new) The method of claim 5398, wherein heating the first section or the second section comprises:

heating a selected volume (V) of the hydrocarbon containing formation from one or more heaters, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day *(Pwr)* provided to the selected volume is equal to or less than $h*V*C_v*\rho_B$, wherein ρ_B is formation bulk density, and wherein an average heating rate *(h)* of the selected volume is about 10 °C/day.

5402. (new) The method of claim 5398, wherein heating the first section or the second section increases a permeability of a majority of the first section or the second section such that the permeability of the majority of the first section or the second section is substantially uniform.

Response To Office Action Mailed December 16, 2002

A. Pending Claims

Claims 2117-2124, 2126-2162, 2164-2192, and 5396-5402 are currently pending. Claims 2117-2124, 2126, 2128, 2140, 2143, 2147-2151, 2153-2161, 2164-2166, 2186-2188, 2190-2192, 5396, and 5397 have been amended. Claims 2125 and 2163 have been cancelled. Claims 5398-5402 are new.

B. Submission of Corrected Formal Drawings

In the Office Action mailed December 16, 2002, the Examiner indicated approval of the proposed drawing corrections filed on February 27, 2002. Applicant submits the corrected

formal drawings approved by the Examiner (nine sheets, including FIGS. 23a, 23b, 32, 56, 57, 67, 68, 72, 73, 76, 81a, and 97).

C. Information Disclosure Statement

The Office Action mailed on December 16, 2002 did not include a signed copy of page 3 of Form PTO-1449 (references A59-A88) of the Information Disclosure Statement filed on December 6, 2001. Applicant respectfully requests a signed, initialed copy of the above-mentioned page. A copy of page 3 of Form PTO-1449 (references A59-A88) of the Information Disclosure Statement filed on December 6, 2001 is enclosed for the Examiner's convenience.

D. Election of Species

In item 1 of the Office Action, the Examiner states: "Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable." Applicant elects the species described in at least claims 2123 and 2161, without traverse. The generic name of the elected species is: "heating a hydrocarbon formation using a natural distributed combustor(s)." Applicant reserves the right for consideration of claims to additional species written in dependent form upon allowance of a generic claim

E. Provisional Double Patenting Rejection

The Examiner provisionally rejected claims 2117-2192, 5396, and 5397 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims of copending U.S. Patent Application No. 09/841,445. Upon issuance of a patent for U.S. Patent Application No. 09/841,445 or the present application, or upon both applications being in condition for allowance but for the provisional double patenting rejection, Applicant will provide arguments for the inappropriateness of the double patenting rejection and/or provide a terminal disclaimer for the patent and/or patent applications.

F. The Claims Are Not Anticipated by Gregoli Pursuant To 35 U.S.C. § 102(b), or in the Alternative, Are Not Obvious Over Gregoli Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 2117, 2119, 2124-2126, 2129-2144, 2146, 2148, 2150-2152 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,016,867 to Gregoli et al. (hereinafter "Gregoli '867"), or in the alternative, as being obvious under 35 U.S.C. § 103(a). Applicant respectfully disagrees with these rejections.

The standard for "anticipation" is one of fairly strict identity. To anticipate a claim of a patent, a single prior source must contain all the claimed essential elements. *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 U.S.P.Q.81, 91 (Fed.Cir. 1986); *In re Donahue*, 766 F.2d 531, 226 U.S.P.Q. 619, 621 (Fed.Cir. 1985).

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981 (CCPA 1974), MPEP § 2143.03.

The Examiner states:

> Overall, Gregoli et al is directed to the in situ conversion of heavy hydrocarbon(s) in a subterranean formation into refinery-friendly lighter oil or hydrocarbon components. Gregoli et al heats the formation using one or more heat sources comprising downhole combustion units (206), and the heating is clearly effected in reducing environment, as called for in claim 2117 (Gregoli, col. 5, line 50 – col. 6, line 8).

Gregoli '867 states:

> The conditions necessary for sustaining the hydrovisbreaking reactions are achieved by injecting superheated steam and hot reducing gases, comprised principally of hydrogen, to heat the formation to a preferred temperature and to maintain a preferred level of hydrogen partial pressure. (Gregoli '867, column

6, lines 32-37)

Amended claim 2117 describes a combination of features including: "providing heat from one or more heaters to at least a portion of the formation; allowing the heat to transfer from the one or more heaters to a part of the formation...." At least the above-quoted features of the claim, in combination with other features of the claim, do not appear to be taught or suggested by the cited art.

Applicant's Specification describes a heater "as any system configured to generate heat in a well or a near wellbore region." (Specification, page 40, lines 6-7) Gregoli '867 appears to teach providing hot fluids into a formation to heat the formation. Gregoli '867 appears to teach providing hot fluids, which freely permeate the formation to be treated (see Gregoli '867, FIGS. 3A, 3B, and 4). Gregoli '867 do not appear to teach or suggest providing heat from a heater to a portion of a formation and allowing the heat to transfer from the portion to a part of a formation. Gregoli '867 does not appear to teach or suggest at least the above-quoted features of claim 2117. Applicant respectfully requests removal of the rejection of claim 2117 and the claims dependent thereon.

Applicant submits that many of the dependent claims rejected by the Examiner are independently patentable. The Examiner states: "As per claims 2125 and 2126, insofar as the heating process may be carried out in a number of phases, e.g., as a hybrid operating mode (col. 11, lines 20-28), it is deemed the Gregoli et al process inherently or obviously effects the heating within the recited rates.

Amended claim 2126 describes a combination of features including: "wherein heating energy/day *(Pwr)* provided to the selected volume is equal to or less than $h*V*C_v*\rho_B$, wherein ρ_B is formation bulk density, and wherein an average heating rate (h) of the selected volume is about 10 °C/day." Applicant respectfully submits that providing heat wherein heating energy/day (*Pwr*) provided to a volume is equal to or less than $h*V*C_v*\rho_B$ is not inherent or obvious to Gregoli '867. Gregoli '867 makes no suggestion for providing a selected amount of heating

energy/day to a volume of a formation. Applicant submits at least the above-quoted features of the claim, in combination with other features of the claim, do not appear to be taught or suggested by the cited art.

The Examiner states:

> Regarding claims 2129-2142, 2152, it is deemed that the myriad hydrocarbon product mixtures recited in these claims would necessarily or obviously occur in carrying out the in situ heavy oil conversion process of Gregoli et al since Gregoli et al is directed overall to the reduction of all deleterious components/contaminants, such as sulfur and 'unstable oxygenated components,' ... and further observes that the hydrogenation, overall, effected by their process will 'convert unsaturated hydrocarbons to saturated hydrocarbons to saturated products (note col. 2, lines 55-59), the precise composition of the product fluids is seen as dictated by the particular hydrocarbon or heavy oil naturally occurring in the particular oil formation actually encountered in the field.

Applicant submits that the product mixtures recited in claims 2129-2142 and 2152 would not be producible by carrying out the in situ combustion process of Gregoli '867. The product mixtures recited in claims 2129-2142 and 2152 may be produced by controlling and/or modifying formation conditions during treatment to produce the selected results recited in the claims. Applicant respectfully requests removal of the rejection of claims 2129-2142 and 2152.

The Examiner states: "As per claim 2148, clearly hydrogen is injected during the Gregoli et al process; the hydrogenation/hydroconversion will inherently or obviously heat the oil formation by the exothermic heat evolved."

Gregoli '867 appears to teach or suggest heating the oxidation products with the heat from the oxidation reaction. Gregoli '867 does not appear to teach or suggest providing hydrogen to a formation to hydrogenate hydrocarbons and heat a part of the formation with the heat produced from hydrogenation.

Amended claim 2148 describes a combination of features including: "providing hydrogen (H_2) to the heated part to hydrogenate hydrocarbons within the part; and heating a portion of the part with heat from hydrogenation." Applicant submits that the combination of features of claim 2148, in combination with other features of the claim, do not appear to be taught or suggested by the cited art.

The Examiner states: "As per claims 2150 and 2151, the process steps therein read on the fracturing and/or preliminary heating steps of Gregoli et al (col. 10, lines 26-55); the precise range of in excess of 100 millidarcy would inherently or obviously occur in such conventional heating/fracturing steps."

Gregoli '867 states: "The method of this invention also includes the creation of horizontal or vertical fractures to enhance the injectibility of the steam and reducing gases and the mobility of the hydrocarbons within the formation so that the produced fluids are recovered at economic rates." Applicant submits that the fluid movement (e.g., movement of hot gases) through the formation may tend to be concentrated in the created fractures thereby increasing permeability proximate the fractures.

Amended claim 2150 describes a combination of features including: "wherein allowing the heat to transfer increases a permeability of a majority of the part to greater than about 100 millidarcy." Gregoli '867 does not appear to teach or suggest increasing the permeability of a majority of the heated part. At least the above-quoted features of claim 2150, in combination with other features of the claim, do not appear to be taught or suggested by the cited art.

Amended claim 2151 describes a combination of features including: "wherein allowing the heat to transfer increases a permeability of a majority of the part such that the permeability of the majority of the part of the formation is substantially uniform." Applicant disagrees that the teachings and suggestions of Gregoli '867 would inherently or obviously encompass an increase in permeability as claimed in the present application. Gregoli '867 does not appear to teach, suggest, or provide motivation for heating a part of a formation to increase the permeability in a

uniform manner. At least the above-quoted features of claim 2151, in combination with other features of the claim, do not appear to be taught or suggested by the cited art.

G. The Claims Are Not Unpatentable Over Gregoli '867 Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 2128 and 2145 as being unpatentable over Gregoli '867 pursuant to 35 U.S.C. § 103(a). Applicant respectfully disagrees with these rejections.

The Examiner states: "The thermal conductivity recited in claim 2128 is deemed an obvious matter of choice or design based on, e.g., the quality of the heavy oil present and/or the matrix characteristics of the particular oil formation in the field." Applicant disagrees that the conductivity recited in claim 2128 is an obvious matter of choice or design.

Amended claim 2128 describes a combination of features including: "wherein providing heat from one or more of the heaters increases a thermal conductivity of at least a portion of the part to greater than about 0.5 W/(m °C)." At least the above-quoted features of claim 2128, in combination with other features of the claim, do not appear to be taught or suggested by the cited art.

Applicant submits that at least the above-quoted feature of claim 2128 is unexpected based on literature in the art. For example, Applicant's Specification states:

> Certain embodiments described herein will in many instances be able to economically treat formations that were previously believed to be uneconomical. Such treatment will be possible because of the surprising increases in thermal conductivity and thermal diffusivity that can be achieved with such embodiments. These surprising results are illustrated by the fact that prior literature indicated that certain hydrocarbon containing formations, such as coal, exhibited relatively low values for thermal conductivity and thermal diffusivity when heated. For example, in government report No. 8364 by J. M. Singer and R. P. Tye entitled "Thermal, Mechanical, and Physical Properties of Selected Bituminous Coals and Cokes," U.S. Department of the Interior, Bureau of Mines

(1979), the authors report the thermal conductivity and thermal diffusivity for four bituminous coals. This government report includes graphs of thermal conductivity and diffusivity that show relatively low values up to about 400 °C (e.g., thermal conductivity is about 0.2 W/(m °C) or below, and thermal diffusivity is below about 1.7×10^{-3} cm^2/s). This government report states that 'coals and cokes are excellent thermal insulators.'

In contrast, in certain embodiments described herein hydrocarbon containing resources (e.g., coal) may be treated such that the thermal conductivity and thermal diffusivity are significantly higher (e.g., thermal conductivity at or above about 0.5 W/(m °C) and thermal diffusivity at or above 4.1×10^{-3} cm^2/s) than would be expected based on previous literature such as government report No. 8364. If treated as described in certain embodiments herein, coal does not act as 'an excellent thermal insulator.' Instead, heat can and does transfer and/or diffuse into the formation at significantly higher (and better) rates than would be expected according to the literature, thereby significantly enhancing economic viability of treating the formation. (Specification, page 150, line 18 to page 151, line 10)

Applicant submits that providing heat from the one or more heaters to heat the part of the formation such that a thermal conductivity of at least a portion of the part is greater than about 0.5 W/(m °C) is not an obvious matter of choice or design. Applicant respectfully submits that the Examiner's rejection of claim 2128 as obvious by matter of choice or design may rely upon personal knowledge of the Examiner and therefore Applicant believes MPEP 2144.03 will apply. Applicant respectfully requests the Examiner to provide support for his assertion either by an affidavit or by references brought to the Applicant's attention. Otherwise, Applicant requests this rejection be removed.

H. The Claims Are Not Unpatentable Over Gregoli '867 in View of Van Meurs Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 2153 and 5396 as being unpatentable over Gregoli '867, as applied to claim 2117 above, and further in view of U.S. Patent No. 4,886,118 to Van Meurs et al. (hereinafter "Van Meurs") pursuant to 35 U.S.C. § 103(a). Applicant respectfully disagrees with these rejections.

As described above, Gregoli '867 does not appear to teach or suggest the use of heaters in a formation. Amended claim 2153 describes a combination of features including: "wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heaters are disposed in the formation for each production well." Amended claim 5396 describes a combination of features including: "wherein at least about 20 heaters are disposed in the formation for each production well." At least the above-quoted features of claims 2153 and 5396, in combination with other features of the claims, do not appear to be taught or suggested by the cited art. Applicant respectfully requests removal of the rejection of claims 2153 and 5396.

I. The Claims Are Not Anticipated by Slater and Schlinger Pursuant To 35 U.S.C. § 102(b), or in the Alternative, Are Not Obvious Over Slater and Schlinger Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 2117-2119, 2123, 2125-2142, 2146-2148, 2150-2152, 2156, 2157, 2161, 2163-2180, 2184, 2185, and 2187-2189 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,617,471 to Slater (hereinafter "Slater") and U.S. Patent No. 3,084,919 to Schlinger et al. (hereinafter "Schlinger"), or in the alternative, as being obvious over Schlinger and Slater under 35 U.S.C. § 103(a). Applicant respectfully disagrees with these rejections.

Amended claim 2117 describes a combination of features including: "controlling the heat such that an average heating rate of the part is less than about 1 °C per day in a pyrolysis temperature range of about 270 °C to about 400 °C...." Amended claim 2156 describes a combination of features including: "controlling the heat such that an average heating rate of the first or the second section is less than about 1 °C per day in a pyrolysis temperature range of about 270 °C to about 400 °C...." Applicant submits that at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

The Examiner states:

> It is deemed that the precise heating rates set forth in claims 2125, 2163, 2126 and 2164, as well as the thermal conductivity recited in claim 2128 and 2166 will inherently or obviously occur during the process of Schlinger et al, as applied to the oil shale formation completed by Slater, based on or dictated by, e.g., the characteristics and properties of the oil shale formation actually encountered in the field.

Applicant submits that controlling the heat such that an average heating rate of a part or section of the formation is less than about 1 °C per day during pyrolysis is not inherent or obvious to Slater and Schlinger. Slater and Schlinger make no suggestion for controlling heating of the formation to control an average heating rate below or above a selected value.

Applicant respectfully submits that the Examiner's rejection of claims 2117 and 2156 as inherent or obvious may rely upon personal knowledge of the Examiner and therefore Applicant believes MPEP 2144.03 will apply.

Amended claim 2126 describes a combination of features including: "wherein heating energy/day *(Pwr)* provided to the selected volume is equal to or less than $h*V*C_v*\rho_B$, wherein ρ_B is formation bulk density, and wherein an average heating rate (h) of the selected volume is about 10 °C/day." Applicant submits that providing heat wherein heating energy/day *(Pwr)* provided to a volume is equal to or less than $h*V*C_v*\rho_B$ is not inherent or obvious to Slater and Schlinger. Slater and Schlinger do not appear to teach or suggest providing a selected amount of heating energy/day to a volume of a formation. Applicant submits at least the above-quoted features of the claim, in combination with other features of the claim, do not appear to be taught nor suggested by the cited art.

As in Section G, Applicant submits that providing heat from one or more of the heaters to increase a thermal conductivity of at least a portion of the part to greater than about 0.5 W/(m °C) is not inherent or obvious. Applicant respectfully submits that the Examiner's rejection of claims 2128 and 2166 as inherent or obvious may rely upon personal knowledge of the Examiner and

therefore Applicant believes MPEP 2144.03 will apply.

The Examiner states: "As per claim 2118, it is deemed that during the initial heating phase and/or the hydroretorting phase of Schlinger et al, as practiced using the multi-well arrangement of Slater, as illustrated, it is deemed that at least some overlap or 'superposition' of the heating from each wellbore will inherently or obviously occur."

Amended claim 2118 describes a combination of features including: "wherein the one or more heaters comprise at least two heaters, and wherein controlled superposition of heat from at least the two heaters pyrolyzes at least some hydrocarbons within the part of the formation." Applicant submits that support for the feature "controlled superposition of heat" can be found in the Specification on at least page 12, lines 17-27. At least the above-quoted feature of claim 2118, in combination with other features of the claim, does not appear to be taught or suggested by the cited art. Applicant respectfully requests removal of the rejection of claim 2118.

The Examiner states:

> Regarding claims 2129-2142 and 2167-2180, it is deemed that the myriad hydrocarbon product mixtures recited in these claims would necessarily or obviously occur in carrying out the heating process of Schlinger et al ....

Applicant submits that the product mixtures recited in claims 2129-2142 and 2167-2180 would not be producible by carrying out the in situ combustion process of Schlinger. As described in Section F, the product mixtures recited in claims 2129-2142 and 2167-2180 may be produced by controlling and/or modifying formation conditions during treatment to produce the selected results recited in the claims. Applicant respectfully requests removal of the rejection of claims 2129-2142 and 2167-2180.

The Examiner states:

> As per claims 2150, 2187, 2151 and 2188, Schlinger et al (col. 5, lines

> 7-16) further indicates that a fractured and resulting 'porous structure of the shale' will occur during their heating process. It is further deemed that such permeability increase will inherently or obviously be substantially uniform, as called for in claims 2151 and 2188. Such permeability increase is deemed to necessarily or inherently encompass an increase to 'greater than about 100 millidarcy', as called for in claims 2150 and 2187; alternatively, to increase the permeability to greater than 100 millidarcy would have been an obvious matter of choice in order to ensure adequate fluid flow through the formation.

Schlinger and Slater do not appear to teach or suggest increasing the permeability of a majority of the part. Applicant submits that the combination of features in amended claims 2150 and 2187, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Applicant disagrees that the teachings and suggestions of Schlinger and Slater would inherently or obviously encompass an increase in permeability as described in amended claims 2151 and 2188. Schlinger and Slater do not appear to teach, suggest, or provide motivation for heating a section of a formation to increase the permeability in a uniform manner. At least the above-mentioned features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Applicant respectfully submits that the Examiner's rejection of claims 2150, 2187, 2151, and 2188 as inherent or obvious may rely upon personal knowledge of the Examiner and therefore Applicant believes MPEP 2144.03 will apply.

J. The New Claims Are Not Anticipated or Obvious In View of the Cited Art

Applicant submits that new claim 5398 and the claims dependent thereon do not read on the cited art. New claim 5398 includes features from claim 2162. The cited art does not appear to teach or suggest at least the features of "controlling a pressure and a temperature within at least a majority of the first or second section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure;..." in

combination with the other features of the claim.

K. Conclusion

Applicant submits that all claims are in condition for allowance. Favorable reconsideration is respectfully requested.

A Fee Authorization is enclosed to cover excess claims fees. If any extension of time is required, Applicant hereby requests the appropriate extension of time. If additional fees are required or if fees have been overpaid, please appropriately charge or credit those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C. Deposit Account Number 50-1505/5659-02300/EBM.

Respectfully submitted,

David W. Quimby

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Date: MARCH 17, 2003